

DEVICE FOR UNLOCKING AN ELECTRONIC COMPONENT THAT IS  
INSERTIBLE INTO A RECEIVING DEVICE

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Cross-Reference to Related Application:

This application is a divisional of U.S. application No.  
09/705,607, filed November 3, 2000.

10 Background of the Invention:

Field of the Invention:

The invention relates to an apparatus for unlocking an  
electronic component, which can be inserted into a retaining  
apparatus, in particular, a transceiver, which is held in the  
15 retaining apparatus by a locking element, with the apparatus  
having unlocking means for unlocking the locking element,  
where the unlocking means are formed integrally with the  
housing or with a part of the housing of the component. It is  
particularly suitable for unlocking transceivers that are  
20 inserted in a sheet-metal structure disposed on a printed  
circuit board and are latched to the structure (pluggable  
transceiver).

It is known for electronic transceivers to be inserted into a  
25 sheet-metal structure that is disposed on a printed circuit  
board. Such configurations are used, in particular, in so-  
called small form factor (SFF) pluggable transceivers that are

physically small. An unlocking apparatus is provided for removing the transceiver from the sheet-metal structure, operates a latching element, and, thus, allows the transceiver to be removed.

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A corresponding configuration is shown in FIG. 5. To couple a transceiver 1 to the connections of a printed circuit board 3, the transceiver is pushed into a housing 2 that is connected to the printed circuit board 3. The housing 2 forms a sheet-metal cage that is normally composed of copper alloy or steel alloy and is formed from a lower part 21, connected to the printed circuit board, and an upper part 22 that can be placed on the lower part. A plug part 6 disposed in the housing is used to make contact with corresponding contacts on the transceiver 1. The transceiver 1 has electronic transducers in a manner known per se, such as a Fabry-Perot Laser or VCSEL laser and a photodiode.

A sheet-metal tongue 5 is provided on the lower part 21 of the housing 2 to secure the transceiver 1 in the housing 2 and, once the transceiver 1 has been pushed into the housing 2, latches behind a latching tab disposed on the bottom face of the transceiver 1 and, thus, locks the transceiver 1 in the housing 2. To remove the transceiver 1 from the housing 2 once again, a separate unlocking element 4 is provided according to the prior art, which pushes the sheet-metal

tongue 5 downwards when it is operated, and, thus, unlocks the transceiver 1.

This relationship is shown in more detail in FIGS. 6a and 6b.

5 The section view in FIG. 6a and the bottom view shown in FIG. 6b show a latching tab 7 on the housing of the transceiver 1, behind which the sheet-metal tongue (see FIG. 6) comes to rest when the transceiver 1 is latched in. The separate unlocking element 4, which is formed by a slide 4, is provided for  
10 unlocking. The slide 4 can be moved in the direction of the latching tab 7 and, when moved appropriately, has inclined unlocking tabs 41 that engage under the sheet-metal tongue 5 so that the latter is pressed away downward and breaks contact with the latching tab 7. The transceiver 1 is, now, unlocked  
15 and can be removed from the connection housing 2.

A first disadvantage of the known configuration is that the moving slide must be attached to the transceiver housing separately. Secondly, the unlocking element is operated in  
20 the direction opposite the movement direction when the transceiver is being removed, that is to say, the operating direction is in the wrong sense because a part that is attached to the housing must be pushed in a direction opposite to the removal direction. A further disadvantage of the known  
25 configuration is that the unlocking element must be moved through several millimeters along the bottom face of the transceiver, and is, thus, difficult to reach and operate.

Summary of the Invention:

It is accordingly an object of the invention to provide an apparatus for unlocking an electronic component, which can be inserted into a receiving apparatus, in particular, a transceiver, that overcomes the hereinafore-mentioned disadvantages of the heretofore-known devices of this general type and that allows easily controllable removal of the component, is of simple construction, and can be produced cost-effectively.

According to the invention, an unlocking apparatus for unlocking an electronic component that can be inserted into a retaining apparatus, in particular, a transceiver, which is held in the retaining apparatus by a locking element, has unlocking means for unlocking the locking element, the unlocking means being formed integrally with the housing or with a part of the housing of the component.

Accordingly, the invention provides that, to unlock a locking element of the retaining apparatus, the unlocking means are formed integrally with the housing of the component or with a part of the housing of the component. Because the unlocking means and the housing are integral, this results in an integral solution that integrates the unlocking means in the housing and, thus, saves an additional part in comparison to the prior art. The production cost is, thus, reduced and

assembly is also simplified because the unlocking means no longer need be fitted to the housing. This, thus, provides a simple and cost-effective solution.

5 In one preferred embodiment of the invention, the unlocking means have a rocker that is formed on the housing or housing part. The rocker in this case includes an operating part, which can be operated by an operator for unlocking, and an unlocking part. When the operating part has not been  
10 operated, the rocker is located in an un-operated position. When the operating part is operated, the rocker moves to an operated position, in which the locking element is unlocked. The use of a rocker to initiate unlocking of the component provides a simple and cost-effective solution. The operating  
15 part is, preferably, lengthened or bent such that it is easily accessible to, and can correspondingly be operated easily by, an operator.

In one preferred development, the rocker is connected to at  
20 least one resetting means, in particular, a reset spring. The resetting means, for example, a leaf spring or a torsion spring, is, preferably, likewise formed integrally with the housing, or with a part of the housing of the component. The use of a reset spring ensures that the component is unlocked  
25 only when the operating part of the rocker is operated and that the component is, otherwise, securely latched in the retaining apparatus. The resetting means that is used engages

on the rocker, preferably, in the region of the rotation axis or tilting axis of said rocker, to ensure that the rocker is reset to the un-operated state in a simple manner. The resetting means, preferably, results in the rocker being  
5 connected to the housing or housing part of the component in this case.

In one preferred refinement of the invention, the operating part of the rocker is disposed in the region of the optical  
10 inlet in the transceiver. As such, the operating part is easily accessible and simple to operate. To avoid reducing the size of the retaining opening in the optical inlet by the configuration of the operating part, the optical inlet, preferably, has an elongated depression, which at least  
15 partially accommodates the operating part and, if appropriate, the unlocking part as well. Because the unlocking part in such a configuration is disposed in the interior of the housing, the housing wall has an opening through which the unlocking part makes contact with the locking element in the  
20 operated state so that the unlocking process can be carried out.

In one further advantageous refinement of the invention, the operating part and the unlocking part are formed in the bottom  
25 face of the housing of the component. Consequently, the unlocking part is immediately adjacent to the locking element, which can be operated when required.

The operating direction of the operating part is, preferably, at right angles to the removal direction of the component, or even in the removal direction of the component. Such an  
5 operating direction can be provided by suitable configuration of the rocker, which is, preferably, in the form of the unlocking apparatus. An operating direction at right angles to or even in the removal direction of the component avoids the situation in the prior art where a movement in the  
10 opposite direction to the removal direction must, first of all, be carried out for unlocking.

The unlocking apparatus according to the invention and the housing are, preferably, manufactured integrally from plastic,  
15 for example, using the cost-effective injection-molding method.

Other features that are considered as characteristic for the invention are set forth in the appended claims.

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Although the invention is illustrated and described herein as embodied in device for unlocking an electronic component that is insertible into a receiving device, it is nevertheless not intended to be limited to the details shown because various  
25 modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description  
5 of specific embodiments when read in connection with the accompanying drawings.

Brief Description of the Drawings:

FIG. 1 is a perspective view of a housing lower part of a  
10 transceiver with an unlocking apparatus according to the invention;

FIG. 2a is a perspective view of a complete transceiver with the unlocking apparatus of FIG. 1, illustrated in a first  
15 form;

FIG. 2b is a perspective view of a complete transceiver with the unlocking apparatus of FIG. 1, illustrated in a second form, rotated through  $180^\circ$  with respect to the view in FIG.  
20 2a;

FIG. 3 is a fragmentary, perspective view of a subregion of a transceiver housing with a second embodiment of the locking apparatus according to the invention;

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FIG. 4a is a perspective view of a transceiver with an unlocking apparatus as shown in FIG. 1, with the unlocking



apparatus being accommodated in a longitudinally running depression in the housing;

FIG. 4b is a fragmentary, perspective view of the transceiver  
5 from FIG. 4a illustrated rotated through 180°;

FIG. 4c is a fragmentary, perspective view of an enlarged detail of the transceiver shown in FIGS. 4a and 4b;

10 FIG. 5 is an exploded, perspective view of prior art transceiver and unlocking apparatus;

FIG. 6a is a fragmentary, cross-sectional view of the transceiver and of the unlocking apparatus of FIG. 5;

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FIG. 6b is a fragmentary, bottom view of the transceiver and of the unlocking apparatus of FIG. 5; and

FIGS. 7 and 8 are fragmentary, perspective views of the  
20 transceiver inserted into a housing with the unlocking apparatus according to the invention being accommodated in a longitudinally running groove in the housing.

Brief Description of the Drawings:

25 A transceiver with the unlocking apparatus according to the prior art was explained in the introduction, with reference to FIGS. 5, 6a, and 6b.

Referring now to the figures of the drawings in detail and first, particularly to FIG. 1 thereof, there is shown an unlocking apparatus 8 according to the invention, which is  
5 formed integrally with a housing lower part 101 of a transceiver 100. The unlocking apparatus 8 and the housing lower part 101 are, preferably, composed of a plastic and are formed jointly.

10 The unlocking apparatus 8 is in the form of a rocker that has a front operating part 81, facing an operator, and an unlocking part 82. At its end, the operating part 81 is bent 90°, thus, forming an operating surface 83 that can easily be operated by an operator. On its head part, the unlocking part  
15 82 of the rocker 8 forms a pushing surface, which presses against a locking element when the operating part 81 is being operated and, consequently, results in unlocking, as will be described below.

20 The rocker 8 is connected to the housing lower part 101 through a web 84. The web 84, in this case, forms the rotation or tilting axis of the rocker 8, that is to say, when the operating part 81 is being operated, the rocker 8 tilts about the axis that is governed by the web 84 so that the  
25 tongue 82 is moved upward when the projection 83 is pressed downward.

At the same time, the web 84 is in the form of a leaf spring and, thus, represents a reset spring that ensures that the rocker 8 is always in a defined initial position when in the un-operated state.

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FIG. 2a shows the complete transceiver 100, in which a housing upper part 102 is placed on the housing lower part 101. The two housing parts are, for example, mechanically bonded to one another. In such a case, it is irrelevant to the invention whether two or more housing parts are provided or even if the housing is integral. The only significant feature is that the unlocking apparatus is formed integrally with at least a part of the housing.

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According to FIG. 2b, the housing upper part 102 has an opening 103 that accommodates the head part of the unlocking part 82 of the rocker 8. This ensures that, when the operating part 81 is being operated, the head part of the unlocking part 82 moves substantially at right angles to the surface of the housing 102, and out of the latter so that a locking part, which rests on the head part, of a retaining apparatus for the transceiver 1, located behind a latching tab 7, can be unlocked.

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In FIG. 2a, it can easily be seen that the operating direction A for unlocking the transceiver 100 runs at right angles to

the ejection direction or removal direction B of the transceiver 100.

FIG. 3 shows an alternative embodiment of an unlocking  
5 apparatus that is integrally connected to a transceiver housing. According to FIG. 3, the unlocking apparatus is, once again, in the form of a rocker 8, which includes an operating part 81 with an operating surface 83 and an unlocking part 82 with a contact surface. The rocker 8 in  
10 this embodiment is cut directly into the housing surface of a housing part 103 of the transceiver 100. In such a case, it is connected to the housing 103 in a sprung manner through a torsion spring 9. For such a purpose, the torsion spring 9 is connected to the housing part 103, firstly, in the region of  
15 the rotation axis of the rocker 8 and, secondly, at its lateral ends. The torsion spring 9 is, in this case, formed by a round plastic rod.

When the operating surface 83 is operated, the rocker 8 tilts  
20 about the axis governed by the torsion spring 9. In the process, firstly, the operating part 82 is moved upward. Secondly, the torsion spring 9 is twisted so that the rocker 8 automatically returns to its initial position when the operating part 81 is released.

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In FIG. 3, it is also easy to see a latching tab 7 on the housing part 103, behind which, in the locked state, a sheet-

metal tongue (which is used as the locking element) of a retaining apparatus for the transceiver 100 comes to rest. When the operating part 81 is being operated, thus, resulting in the unlocking part 82 being raised, such a sheet-metal  
5 tongue is moved away vertically upward from the housing surface and is, thus, disengaged from the latching tab 7 so that the transceiver 100 can be removed from the retaining apparatus.

10 Because the operating surface 83 of the operating part 81 projects from the surface of the housing part 103, the unlocking apparatus can be operated in a simple manner.

FIG. 4a shows a further exemplary embodiment of the invention,  
15 in which the unlocking apparatus is, in principle, in the form described with reference to figure 3. One difference is that the bottom face 104a of the housing part 104 has, in the center, a depression or groove 105 that runs in the longitudinal direction and that substantially contains the  
20 operating part 81 of the rocker. This ensures that the optical inlet 106 of the transceiver, which is used to accommodate the optical plugs, is not reduced in size by the operating element 81.

25 FIG. 4b shows a view of the transceiver 100 rotated through 180°, in which the unlocking part 82 and the latching tab 7

can also be seen, in addition to the operating part 81 disposed in the groove 105.

According to FIG. 4c, a reset spring 9 is provided, which is  
5 formed in a corresponding manner to the reset spring in FIG. 3.

Once the transceiver 100 has been inserted completely into a housing 2, as shown in FIGS. 7 and 8, a sheet-metal spring 5  
10 on the housing latches in behind the latching tab 7 of the transceiver 100, and, thus, locks the transceiver 100 to the housing 2. All that is required to release the lock is to press the easily accessible operating part 81 slightly vertically upward in the direction of the arrow A. As a  
15 result, the unlocking part 82 presses the sheet-metal tongue away from the latching tab 7, overcoming the locking of the transceiver 100 to the housing 2.

The embodiment of the invention is not limited to the  
20 exemplary embodiments described above. The only significant feature for the invention is that the unlocking means of the unlocking apparatus are formed integrally with the housing or with a housing part of an electronic component.